Lambda Deployment
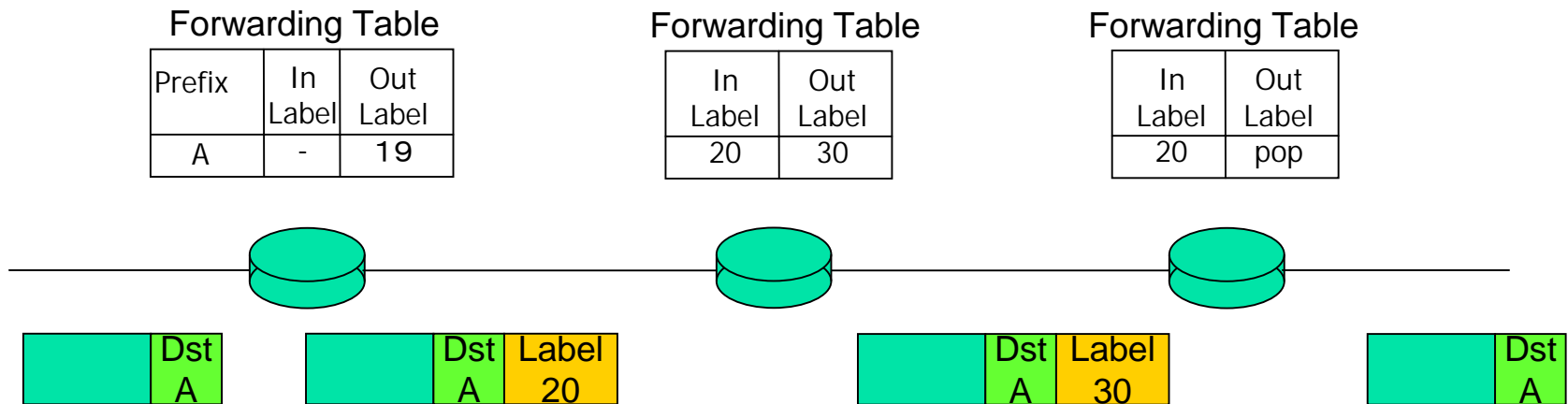## - GMPLS -

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What is GMPLS?

- GMPLS stands for "Generalized MPLS".
- GMPLS differs from traditional MPLS in that it supports multiple types of switching such as:
  - PSC : Packet Switch Capable
  - L2SC : Layer 2 Switch Capable
  - TDM : Time-Division Multiplex capable
  - LSC : Lambda Switch Capable
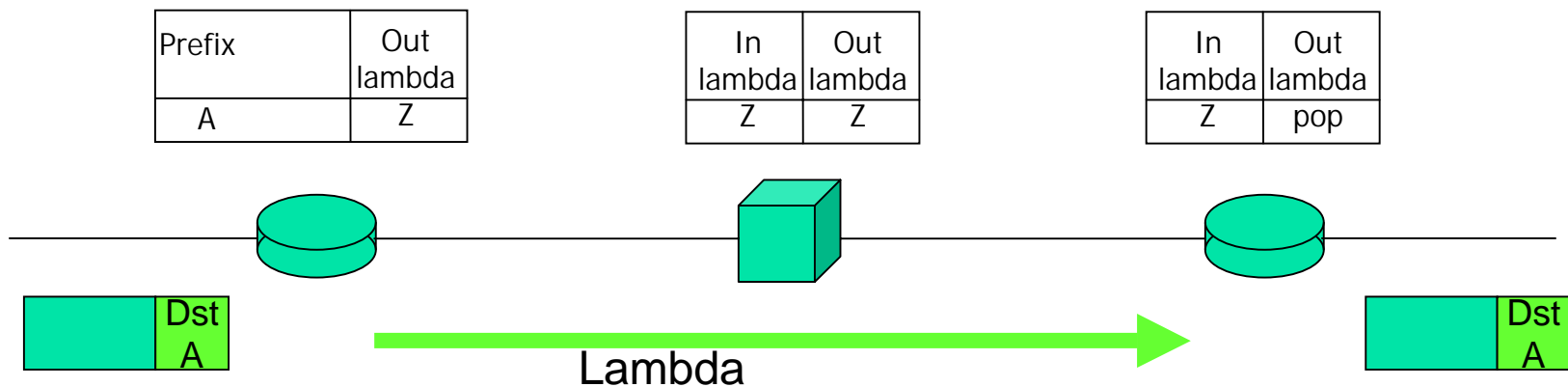 - FSC : Fiber Switch Capable

MPLS Overview

- RSVP-TE signaling creates a forwarding table.

Forwarding Table

Prefix	In Label	Out Label
A	-	19

Forwarding Table

In Label	Out Label
20	30

Forwarding Table

In Label	Out Label
20	pop

	Dst A

	Dst A	Label 20

	Dst A	Label 30

	Dst A

GMPLS - Forwarding

- GMPLS is similar to MPLS.
- For example, the label is lambda.

Prefix	Out lambda
A	Z

In lambda	Out lambda
Z	Z

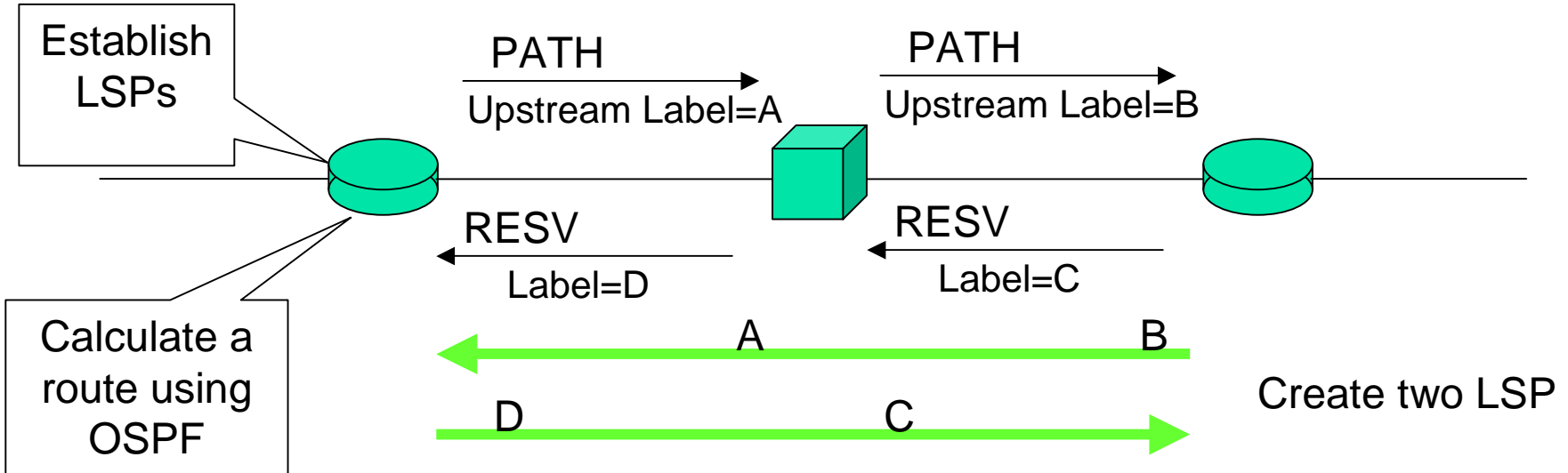| In lambda	Out lambda
Z	pop

Dst A

Lambda

Dst A

Extension from MPLS

- ## Signaling
  - RFC3473: GMPLS Signaling RSVP-TE Extensions

- ## Routing
  - Routing Extensions in Support of GMPLS draft-ietf-ccamp-gmpls-routing (Status RFC Ed Queue)
  - OSPF Extensions in Support of GMPLS draft-ietf-ccamp-ospf-gmpls-extensions (Status: RFC Ed Queue)

- ## Link Management
  - Link Management Protocol (LMP) draft-ietf-ccamp-lmp (Status: RFC Ed Queue)

Signaling: RSVP-TE

In label	Out label
A	Pop
-	D

In Label	Out Label
B	A
D	C

In label	Out label
C	Pop
-	B

Establish LSPs

PATH
Upstream Label=A

PATH
Upstream Label=B

RESV
Label=D

RESV
Label=C

Calculate a route using OSPF

A   B

D   C

Create two LSP

Routing: OSPF

- LSP path is calculated by using OSPF information in the head end.
- OSPF information has all network topology.
- This calculation is similar to MPLS.

Which path is better ?

Which path is better for backup.
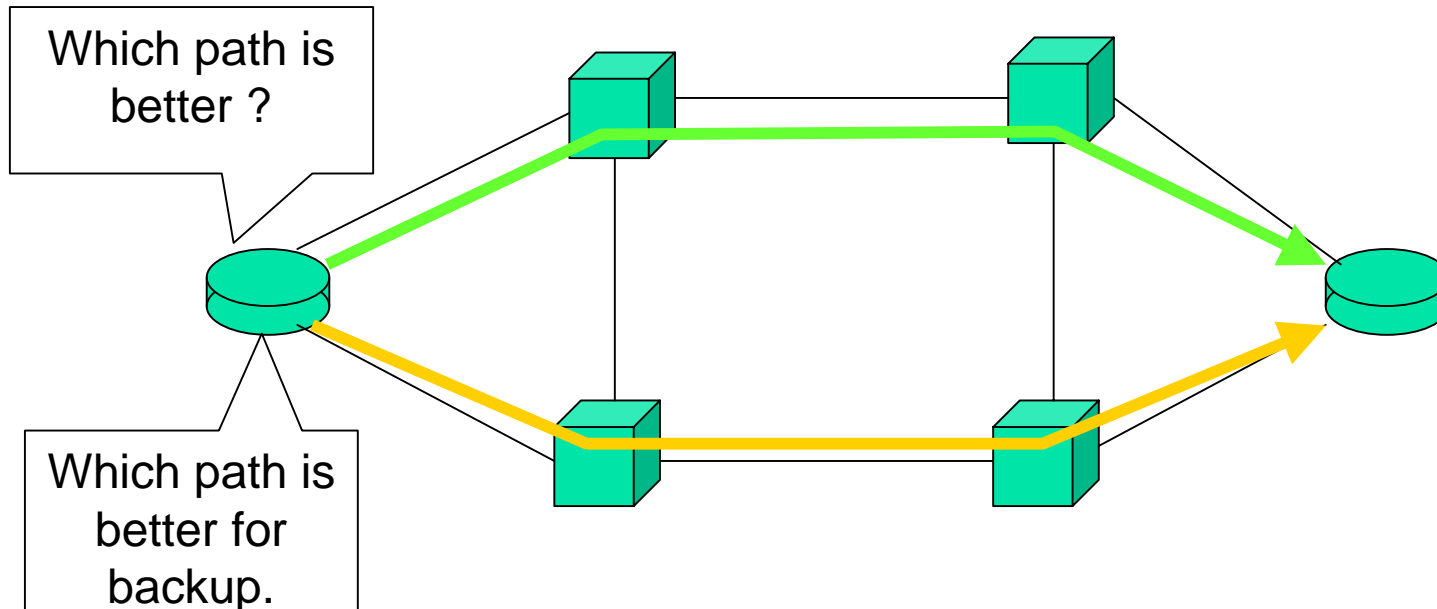
Routing: OSPF
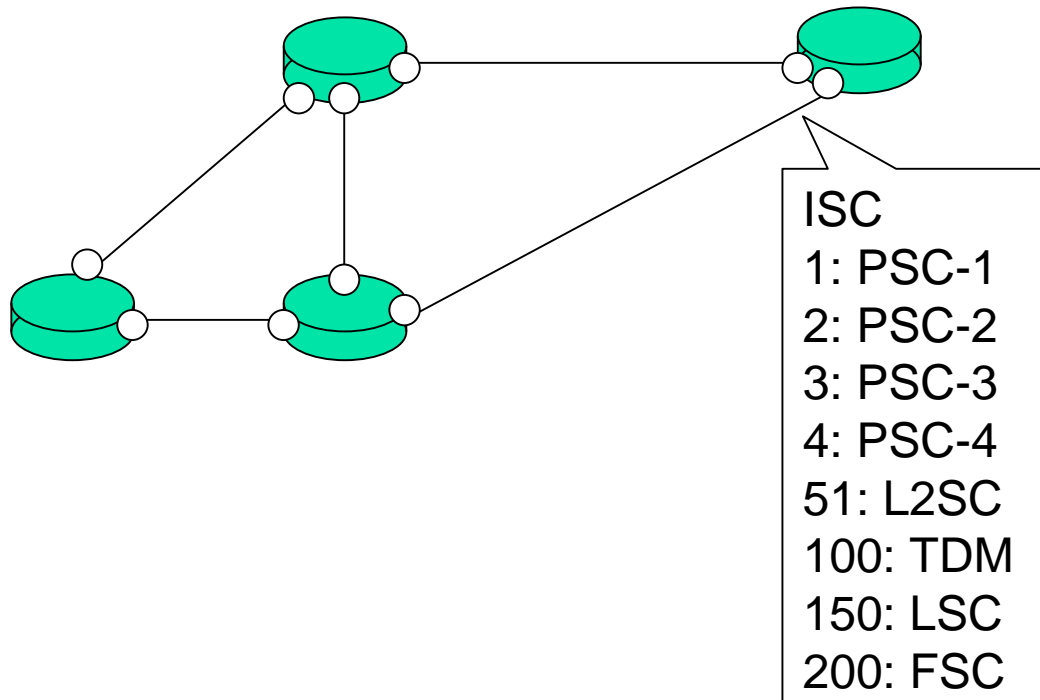
- Difference from MPLS are:

draft-ietf-ospf-gmpls-extensions-12.txt

  - Link Local/Remote Identifiers
  - Link Protection Type
  - Interface Switching Capability Descriptor
 - Shared Risk Link Group

OSPF - Interface Switching Capability Descriptor

■ **Exchange Interface Switching Capability using OSPF opaque LSA**

ISC
1: PSC-1
2: PSC-2
3: PSC-3
4: PSC-4
51: L2SC
100: TDM
150: LSC
200: FSC

OSPF – Shared Risk Link Group

- "shared risk link group (SRLG)" if they share a resource whose failure may affect all links.

- For example, two fibers in the same conduit would be in the same SRLG.

Shared Rink Link Group
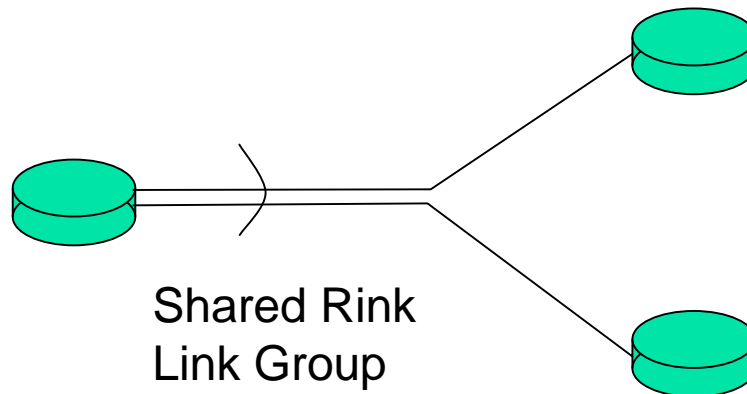
LMP – Link Management Protocol

- Two core procedure of LMP are:
  - control channel management
    - Config message exchange
    - fast keep-alive mechanism
  - link property correlation
- Optional procedure of LMP are:
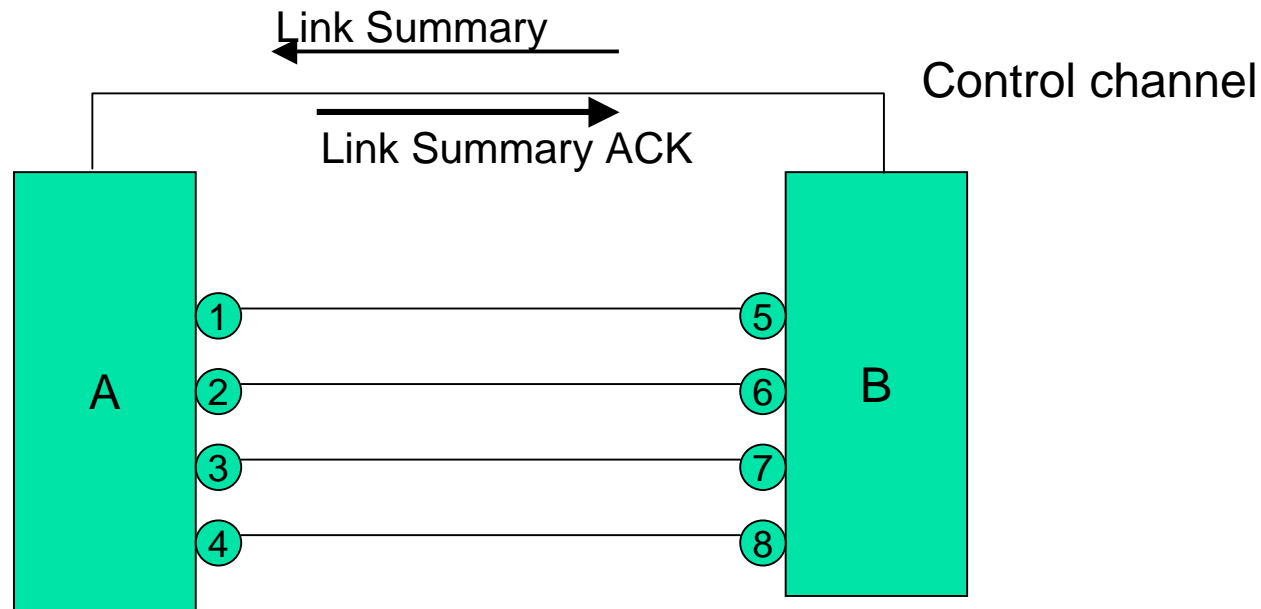 - Verifying Link Connectivity
  - Fault Management

LMP – Control Channel Management

- Establish control channel
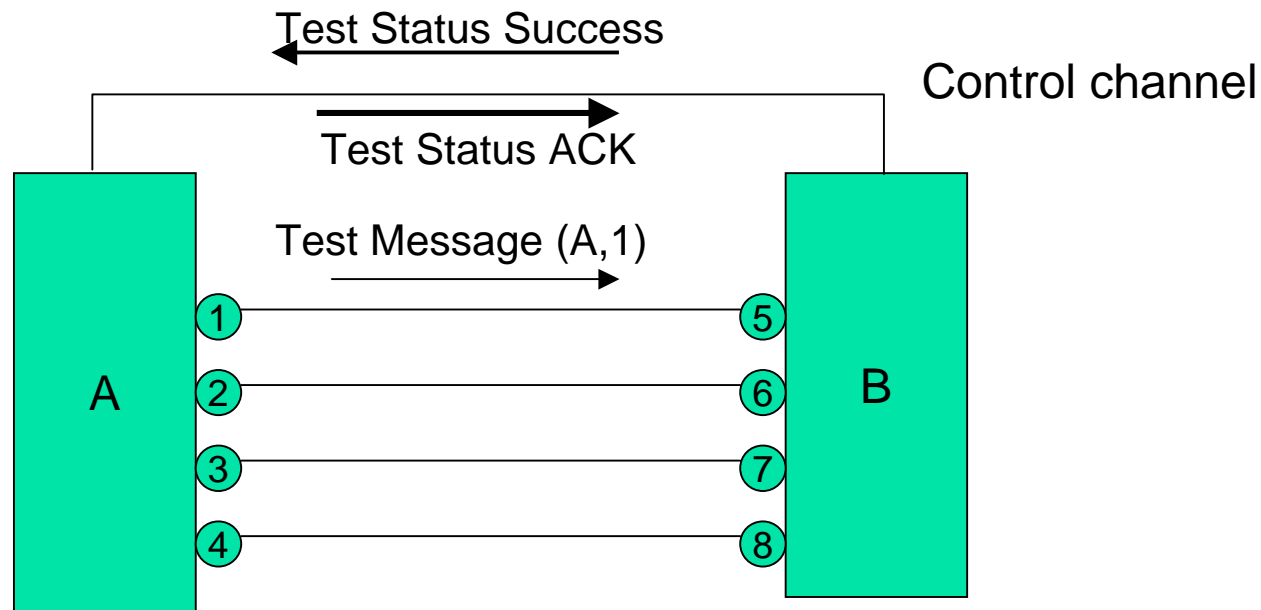- Maintain control channel connectivity
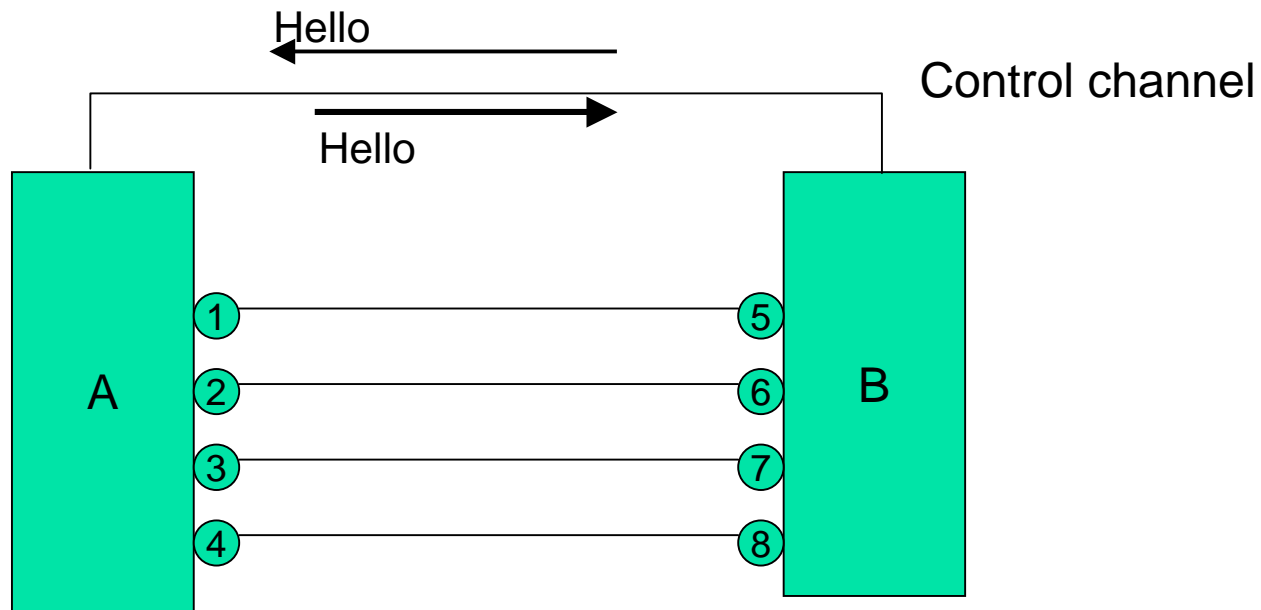
LMP - link property correlation

- Exchange and verify for consistency the TE and data link information on both sides.

Link Summary

Link Summary ACK

Control channel
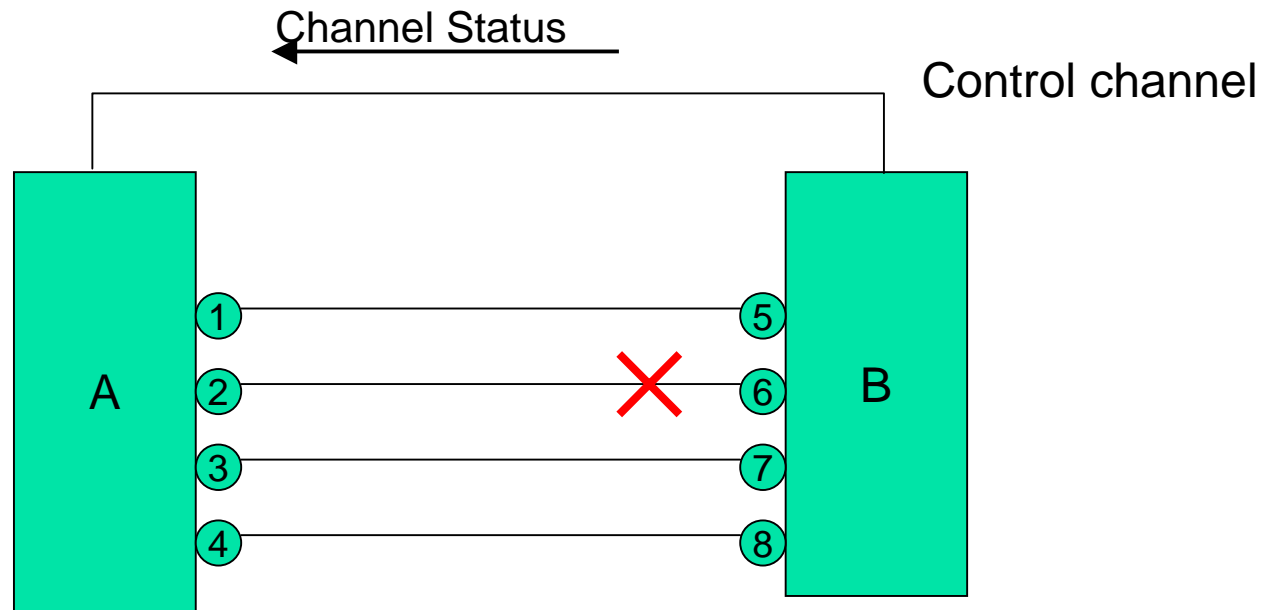
A

B

1
2
3
4

5
6
7
8

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LMP – Verifying Link Connectivity

- To verify the physical connectivity of the data links and dynamically learn (i.e., discover) the TE link.

- The procedure SHOULD be done when establishing a TE link, and subsequently, on a periodic basis for all unallocated (free) data links of the TE link.

Test Status Success

Control channel

Test Status ACK

Test Message (A,1)

A

1 —— 5
2 —— 6
3 —— 7
4 —— 8

B

LMP – Fault Management

Channel Status

Control channel

A

1
2
3
4

5
6
7
8

B

Questions ?